

**Historic, Archive Document**

Do not assume content reflects current scientific knowledge, policies, or practices.



Reserve  
aTP373  
.3  
.H36  
1949

*Matlack*

ADMINISTRATIVE USE - DIRECT DISTRIBUTION PROGRAM

United States Department of Agriculture  
Production and Marketing Administration  
Food Distribution Programs Branch  
Washington, D. C.

# HANDBOOK ON STORING DIRECT DISTRIBUTION FOOD

This handbook does not supersede existing USDA official procedures or technical publications. It is offered for the information and guidance of distributing agencies, schools, and Institutions handling USDA donated commodities.

JANUARY 1949

**United States  
Department of  
Agriculture**



**National Agricultural Library**

# CONTENTS

## PART I INTRODUCTION

Page

1. Legislative reference.....	3
2. General history.....	3
3. Purpose of handbook.....	3
4. Basic principles.....	3
5. Definitions.....	4
6. Responsibilities.....	4

## PART II THE WAREHOUSE..... 4

General.....	4
1. Structural requirements.....	5
a. Floor load.....	5
b. Protection from elements, insects, and rodents	5
2. Cleanliness and sanitation.....	5
3. Ventilation.....	5
4. Light.....	6
5. Temperatures.....	6
6. Safety.....	6
7. Protection against pilferage and burglary.....	6
8. Scales and measuring devices.....	7

## PART III HANDLING AND STORAGE AT WAREHOUSE..... 7

1. Car entry.....	7
2. Inspection of Contents of car or truck on arrival..	7
3. Completion of documents.....	8
4. Space assignment.....	8
5. Piling and stacking.....9,10,11,12,13	
6. Warehouse Stock Control.....	14
7. Infestation and rodent protection.....	15
a. Spraying.....	15
b. Fumigation.....	15
c. Rodent control.....	15
8. Handling commodities that have become unfit for human consumption.....	16
9. Disposal of containers.....16,17	
10. General storage suggestions.....	17
11. Warehouse inspections.....17,18,19,20	

## PART IV SHIPPING SUGGESTIONS..... 21

1. General.....	21
2. Repacking equipment and personnel.....	21
3. Documentary control, outgoing shipments.....	21
4. Suggested "shipping ticket".....	22

U.S. DEPARTMENT OF AGRICULTURE  
NATIONAL AGRICULTURAL LIBRARY

MAR 3 1993

CATALOGING PREP.

1.	Beverages.....	24
2.	Canned fruits and vegetables.....	25
3.	Cereals and cereal products.....	26
4.	Dairy products.....	27
5.	Dehydrated foods.....	28
6.	Dried fruits.....	29
7.	Eggs and poultry.....	30
8.	Fats and oils.....	31
9.	Fresh fruits and vegetables.....	32
10.	Fresh citrus fruits.....	33
11.	Meat.....	34
12.	Meat (Variety) and fish.....	35
13.	Misc.(Baking powder, yeast, pickles, relish).....	36
14.	Nuts.....	37
15.	Seasoning agents.....	38
16.	Sugar, honey, jam, molasses, chocolate, and syrup...	39
17.	Apples.....	40
18.	Cabbage.....	41
19.	Dry beans - onions.....	42
20.	Orange juice concentrate.....	43
21.	Pears.....	44
22.	Potatoes.....	45
23.	Sweet potatoes.....	46

## PART I. INTRODUCTION

### 1. LEGISLATIVE REFERENCE

Food commodities are presently distributed to schools under provisions of Section 6 of the National School Lunch Act, Public Law 396, approved June 4, 1946. They are also distributed to schools, institutions, and other eligible outlets pursuant to Section 32 of the Act of August 24, 1935, as amended, and related legislation, and Section 9 of the National School Lunch Act. For convenience, this second grouping is referred to as "Section 32."

### 2. GENERAL HISTORY

Between 1935 and 1947 approximately \$477,000,000 has been expended from USDA appropriations for food commodities distributed country-wide through State and local agencies to eligible schools, welfare agencies, and institutions. Although distribution was curtailed during the war years commodities have been continuously issued in sufficient quantity to merit proper care and an efficient handling system.

### 3. PURPOSE OF HANDBOOK

This handbook has been prepared to assist interested agencies in the warehousing phase of the Direct Distribution programs. Required procedure has been omitted and such operational material as is included is for general information and assistance. Much detailed material has been extracted from technical publications and rewritten as far as possible in non-technical language. No attempt has been made to enter the fields of either food preservation or food preparation.

### 4. BASIC PRINCIPLES

The basic principles of Section 32 food distribution have been the same for years. Agencies must agree in advance to accept such commodities. They must not be sent where they will affect local markets. They must be used in addition to, and not in substitution for, food that would otherwise be furnished by the recipient agency. In reporting, the Section 32 commodities must be kept separate from Section 6 commodities, because Section 32 commodities purchased under support programs are for distribution to all eligible schools and institutions. Section 6 commodities are purchased from funds provided under the National School Lunch Act and are distributed *only* to schools participating in the National School Lunch Program. No physical segregation of or other discrimination against any child shall be made by the school because of his inability to pay.



## 5. DEFINITIONS

- (a) **USDA.** The abbreviation USDA used throughout this handbook refers to the United States Department of Agriculture and such of its Administrations or Branches as may be responsible for food distribution under existing legislation.
- (b) **Distributing Agency.** The term, Distributing Agency, means such agencies as receive commodities for distribution to other agencies within a State or a segment of a State under provision of contractual agreements with the USDA. Distributing Agencies are usually departments of State Governments such as Department of Education, Welfare, etc.
- (c) **Sponsoring Agency.** A sponsoring agency may be a private or public association or organization that has entered into a distribution agreement with the distributing agency. For example: Parent-Teachers Association, Rotary, Board of County Commissioners, City Council, School Board, etc.
- (d) **Consignee.** Any agency to which is sent a shipment of commodities.
- (e) **Sharing Agency.** Any agency, other than the consignee, that participates in the consignment. (Like "consignee," this is a general term applicable to all agencies on occasion.)
- (f) **Recipient Agency.** An individual school, institution, etc., that receives food and serves it to the consumer under a distributing agency's agreement, or as one of several outlets under a sponsoring agency's agreement.

## 6. RESPONSIBILITIES

Under existing legislation, distributing agencies, recipient agencies, and the USDA, have certain joint and individual responsibilities. Donated commodities must be carefully handled and their disposition properly reported. The USDA and distributing agencies have a direct contractual relationship. Distributing agencies and sponsoring or recipient agencies operate under a similar direct agreement which is subject to approval of the USDA. Both the USDA and the distributing agency may, at reasonable times, review and inspect the operations of the sponsoring agencies.

## PART II. THE WAREHOUSE

### GENERAL

Commodity warehouses should be conveniently located for receiving and forwarding shipments to the areas served. Care should be taken when selecting a warehouse to determine its adequacy for type of storage intended. Cold storage should be used for all highly perishable items. If cold storage is not



available, a well ventilated basement or cellar, if dry, is of value because underground temperature is less variable than temperature at ground level. Some of the important things to consider in selecting and operating a warehouse are as follows:

## 1. STRUCTURAL REQUIREMENTS

Warehouses should be substantially constructed of some acceptable building material which will provide safe and sanitary conditions for food storage and safe and healthful working conditions for employees. Consideration must be given to the provision of adequate outside platforms for reception or shipment of commodities by railroad car or truck.

- (a) Floor Load. Floor load capacity should be approved by a safety engineer or building inspector and a floor load chart posted before storage is actually begun. Floor load charts should be posted conspicuously throughout the building and should be followed without exception. These charts should show not only the per square foot capacity recommended for the main floor space but that of all anterooms, packing rooms, supply rooms, and rest rooms. Normally, capacity load data can be obtained from the city building inspector or owner of the building or warehouse.
- (b) Protection from Elements, Insects, and Rodents. Buildings should be tightly constructed, water-proofed, and all windows and doors should be screened with a fine mesh screen wire to prevent the entrance of insects and rodents.

## 2. CLEANLINESS AND SANITATION

A high degree of cleanliness should be maintained in food store rooms at all times. Walls should be painted, calcimined, or whitewashed periodically. Floors should be scrubbed or mopped regularly and swept daily. The use of sweeping compound is recommended, but if not available, the floor should be sprinkled lightly before sweeping. All trash, rubbish and spoilage should be removed daily and placed in trash cans provided for that purpose. Covers on garbage cans should fit securely. Rest rooms should be scrubbed daily and kept conspicuously clean. Running water should be available and an adequate supply of soap and paper towels should be readily accessible for the use of employees. When personnel are handling food, they should not use tobacco.

## 3. VENTILATION

Ample ventilation is essential to the proper storage of any type of food. Ventilation not only retards growth of various types of bacteria, molds, and diseases affecting plant life, but assists in controlling temperatures in both winter and summer. Good ventilation insures absorption of moisture which prevents mustiness, and retards the rusting of metal containers.

#### 4. LIGHT

Sufficient light, either natural or artificial, should be provided to insure safe and efficient operation. Poor light is contributory to unsatisfactory warehousing conditions generally.

#### 5. TEMPERATURES

Care should be exercised to control temperatures at all times. All warehouses should have some means of heating or cooling which should be sufficient to maintain temperature and at the same time allow for humidity control. Care should be taken in arranging stock so that those commodities affected most by heat in summer be placed in the coolest section of the warehouse and those most susceptible to freezing in winter be placed in the warmest section.

#### 6. SAFETY

Safety engineers should visit commodity warehouses regularly and their recommendations should be followed very closely. A few of the important points are:

- (a) First aid kits should be properly filled and accessible at all times.
- (b) Hand Fire Extinguishers should be regularly inspected and kept available in usable condition.
- (c) Permanently installed sprinkler or hose systems should be regularly tested to meet insurance underwriting requirements.
- (d) Commodities should be so stacked as to present the maximum amount of safety and still conform to acceptable methods and practices in warehousing. A floor load chart should be posted and used.
- (e) Persons handling food should be required to adhere to State regulations regarding periodic physical examinations. Where no State law exists, they should be encouraged to present health certificates at least twice each year.
- (f) Warehouse aisles must be kept open and clear of commodities, empty packages, debris, etc.

#### 7. PROTECTION AGAINST PILFERAGE AND BURGLARY

Usual commercial practice should be followed in that accessible windows should be covered with strong bars, doors, protected with bar locking devices, and large warehouses with burglar alarm systems. Within the warehouse, high value items or broken case lots should be further protected by being stored behind locked enclosures.

## 8. SCALES AND MEASURING DEVICES

All scales, measuring units, and dispensing equipment should meet with standard inspection requirements. Spring-operated scales are not recommended.

## PART III. HANDLING AND STORAGE AT WAREHOUSE

### 1. CAR ENTRY

When commodities have been received at a warehouse or team track, the responsibility for their proper disposition passes to the Distributing Agency. The Distributing Agency personnel should make certain that seals have not been broken and that the contents are in good condition. It is recommended that Distributing Agencies "accept" carloads with partial loss of contents. Only in cases of *total loss* should shipments be rejected. If damage exceeds 3 percent, the Control Office of the Distributing Agency should be notified immediately.

### 2. INSPECTION OF CONTENTS OF CAR OR TRUCK ON ARRIVAL

The type of inspection necessary upon arrival of foodstuff will vary with commodity involved, method or type of pack, season of year and car unloading plan. Extensive spoilage of most foods can be detected by odor. Infestation can be detected by condition of containers, or appearance of the commodity. Canned items should be examined for excessive rust or for collapsed, bulging, or leaking cans. It is recommended that 5 percent of the total number of outside containers in each lot received in each shipment should be opened and inspected during unloading by taking a proportionate number of containers from the following locations in the car:

- (a) From top of load at center.
- (b) From top of load midway between sides of car and midway between center and ends of car.
- (c) From top of load at each end of car.
- (d) From half-way between top and bottom of load from positions described as a, b, and c.
- (e) From bottom of load from positions described as a, b, and c.

After containers are removed from the load and thoroughly examined, a permanent record of results of the spot inspection should be made at the carload receiving point. In some instances, the containers on a car may have been received from more than one vendor or from more than one lot of a vendor's stock. When this happens, the inspection record should contain such stock, or lot identification.

**NOTE:** Cans or bottles need not be opened at warehouse or carload receiving point for inspection unless the outside of such containers shows evidence of internal decomposition or loss.

### 3. COMMODITIES IN BULK

Samples should be taken from each shipment of commodities received in bulk in the same manner as for commodities in containers. Fifty-pound samples at each point in a car of commodities in bulk is a sufficient spot inspection. When bulk commodities are received in cases, such as oranges, grapefruit, and other fresh vegetables, a representative number of the containers should be weighed so that the gross, tare, and net weights may be recorded as accurately as possible for the entire shipment. A similar inspection should be made of commodities received by truck shipment.

### 4. COMPLETION OF DOCUMENTS

After the truck or car is opened and contents examined, an authorized agent of the consignee must complete the required documents. Interested parties are referred to established "Food Distribution Programs Branch Procedure" for detailed information as to the handling of USDA shipping documents.

### 5. SPACE ASSIGNMENT

In a small warehouse, space assignment is no real problem, but small or large, the following factors should be considered:

- (a) **Slow Moving, Fast Moving, Attractive, and Heavy Items.** Fast moving items should be stored nearest the warehouse exits, all other things considered. Attractive items or broken lots should be protected by being kept in locked separate rooms, or screened off sections. Heavy items should be stored in places with the maximum floor capacity. Each floor, or section of a floor, of the warehouse should be charted, and numbered so that stock can be quickly located, and unused space recorded. All commodities should be marked or numbered for easy identification.
- (b) Whenever possible, similar items, for example, all canned foods, or all cereals, or all fresh vegetables, or all dried fruits, etc., should be stored next to each other in groups.
- (c) Dried fruits and cereals, as groups, should be placed in different sections of warehouses as they attract the same insects.
- (d) A stack of dried fruit or a stack of cereal should never be placed closer than within 4 feet of a stack of similar products and should be placed farther apart whenever space permits, to reduce the possibility of spread of infestation, should one stack go bad.
- (e) No commodity should be stacked against a warehouse wall or near a heating plant.
- (f) Commodities should not be stacked high enough to cause the top layer to be too near the roof, as the upper layers of air are several degrees warmer than those near the floor.



## 6. PILING AND STACKING

Sufficient space to permit accessibility for commodity inspection, inventory, and removal is essential. (See Illustration No. 1) Main aisles must

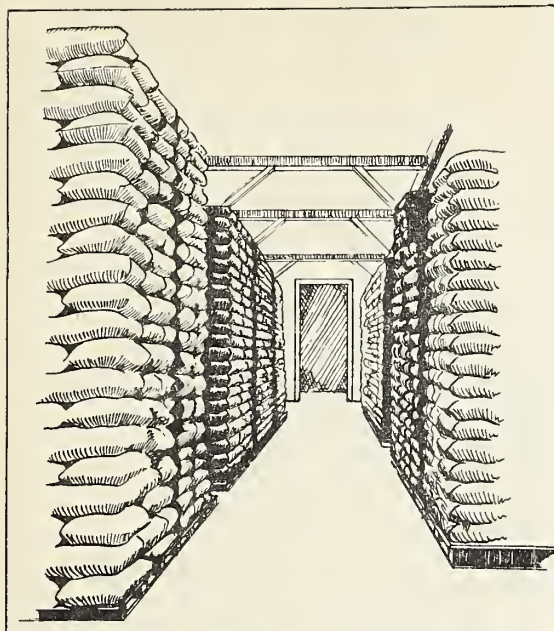


ILLUSTRATION NO. 1

be maintained for commodity removal; and cross aisles for ventilation, inspection, and inventory purposes. Good storage practice involves the use of the three dimensions of the facility and not merely the two-dimensional floor space. The height of storage piles is governed in each instance by the commodity stored (See Illustrations Nos. 1 and 3.) However, the height permitted by the nature of a given commodity is usually in excess of that permitted by floor load capacity. Thus, the third dimension of height may generally be used to the maximum extent permitted by floor load capacity without detriment to the commodity stored. Effective use of this third dimension will more than compensate for the slight loss in floor space caused by leaving space between lots.

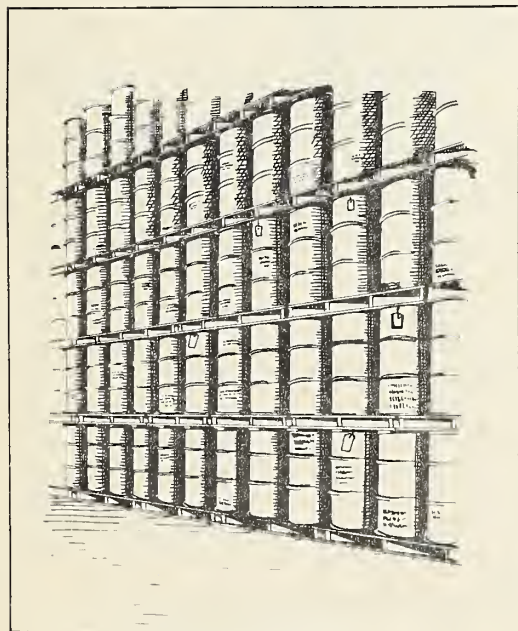


ILLUSTRATION NO. 2

Proper piling and stacking require the use of dunnage under nearly all commodities, and, in many instances, between layers. A number of warehouses employ mechanical equipment in handling stocks. Such warehouses usually possess pallets, which are used in stowing and also serve as dunnage. (See Illustrations Nos. 1, 2, and 3.) The use of corner guards in piling and stacking is also advisable. They afford the bottom containers protection against bumping and damage. (See Illustration No. 3.)

Stowing of commodities in regular piles is of the utmost importance. Cased canned goods

should not be stacked more than 20 cases high. Higher stacking often breaks cases and even bursts cans. Likewise, sacked commodities should not exceed 20 sacks in height. (See Illustrations Nos. 3 and 1.) Excessive stacking frequently bursts sacks and causes pressure caking of finely ground grain commodities in lower layer sacks. Stacking must be orderly and in such a manner that each lot is readily identifiable. Barrels and kegs containing liquid must be stored on their sides to prevent, insofar as possible, their drying out.

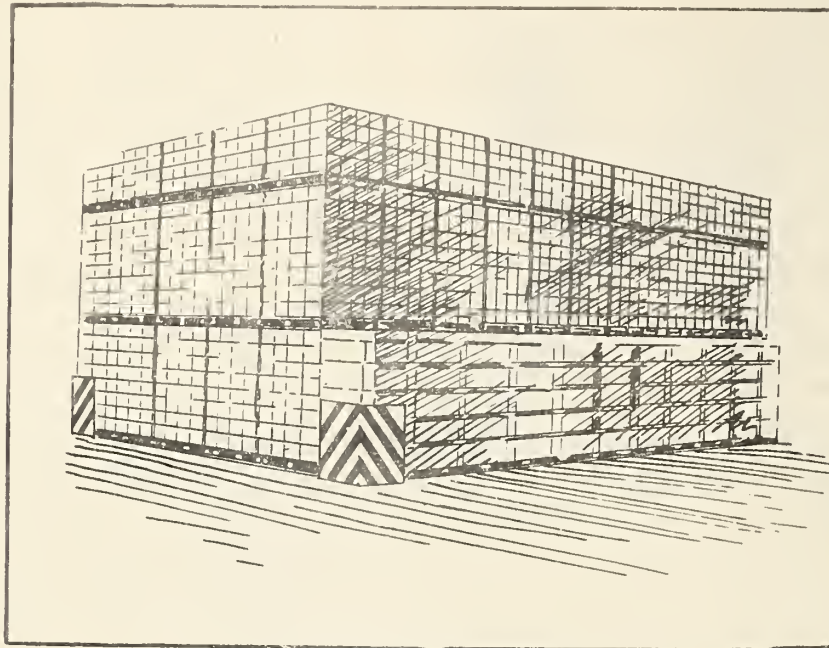


ILLUSTRATION NO. 3

In nearly all instances, stocks in cold or freezer storage require maintenance of a constant ratio between temperature and humidity. To achieve the best results, the temperature in storage rooms should be held fairly constant, and commodities should not be stored too closely. Stowing too closely will not permit all parts of a pile to maintain the required temperature.

For laying out bottom tiers according to approved methods and for computing the number of tiers that can be piled without exceeding the safe floor load limit, the following procedure is suggested:

Lay out the first tier in accordance with approved method. (See following illustrations for each type of container.) Measure the square foot area of the first tier as laid out, including the aisle and ventilating space. Multiply the approved per square foot safe floor load by the square foot area laid out. The result will be the total pounds of safe floor load for the area. Divide



this total allowable weight for the area by the gross weight of the container to be stacked and the result will be the maximum number of a given type of container that can be piled in the area.

Formula:  $\text{Square feet of area} \times \text{safe floor load per square foot} = \text{Gross weight of container}$

For Example: Given a safe floor load of 90 lbs. per square foot, 100 lb. bags are to be stacked. The area of the stack, including aisle and ventilating space, is 4 feet by 4 feet or 16 square feet. Multiplying 16 (the number of square feet in the area) by 90 (the number of lbs. of safe floor load per square foot) equals 1440, the number of pounds that can be safely stacked in the area. Dividing 1440 by 100 (weight of each container) equals 14, which is the number of containers that can be piled in the area within the safe floor load limit.

In no case, however, shall the height of a stack exceed practical limits, i.e., too high for safe lifting or to heights that might cause the stack to tip or crush the bottom containers, even though such heights may be allowable within the limits of the safe floor load.

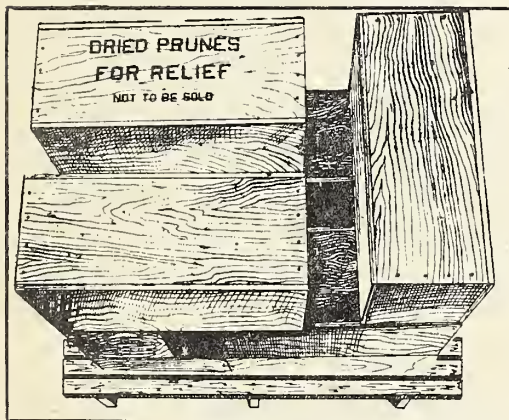


ILLUSTRATION NO. 4  
DETAIL OF CORRECT PILING OF BOXED PRUNES FOR AERATION  
AND SAFE PILING NOTE 'TIE-IN' OF BOXES.

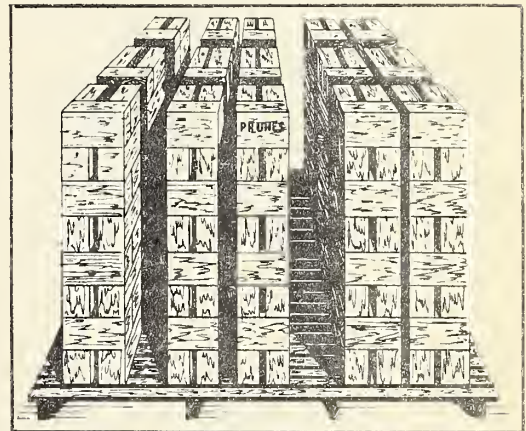
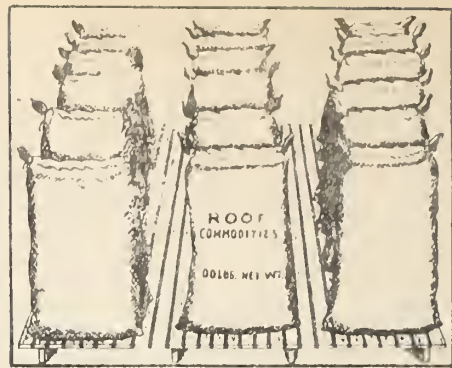


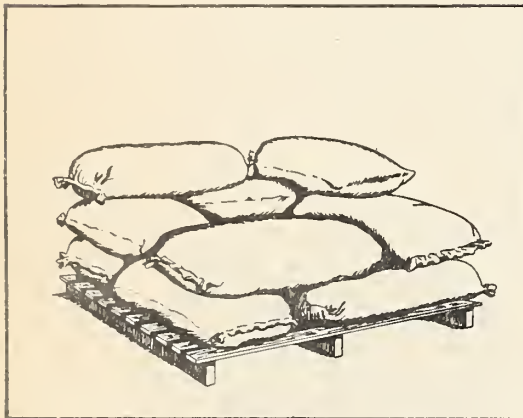
ILLUSTRATION NO. 4-A  
COMPLETED STACK OF BOXED PRUNES.



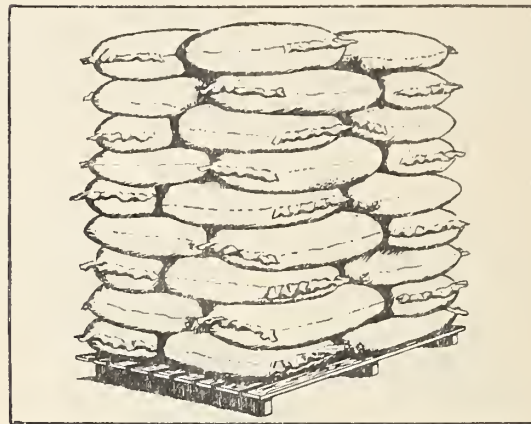
CORRECT METHOD OF PILING BUSHEL BASKET CONTAINERS.  
ILLUSTRATION NO. 5



CORRECT METHOD OF STORING SACKS  
OF 'ROOT' COMMODITIES.  
ILLUSTRATION NO. 6



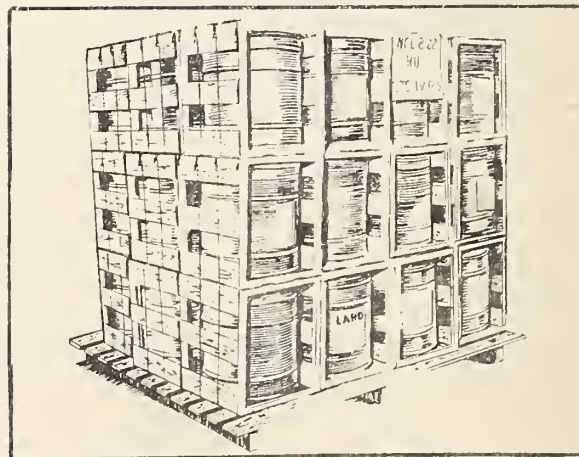
DETAIL OF CORRECT PILING OF 100# SACKS.  
'NOTE 'TIE-IN' OF SACKS.  
ILLUSTRATION NO. 7



COMPLETED STACK OF 100# SACKS.  
ILLUSTRATION NO. 7-A

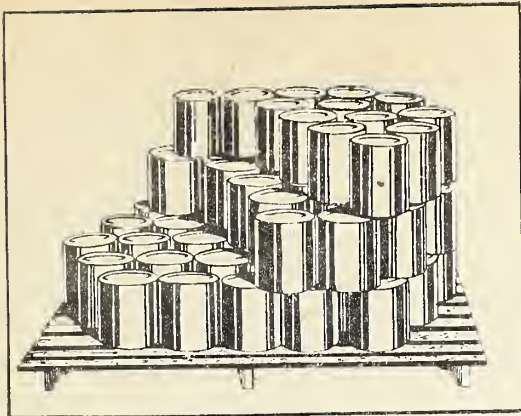


CORRECT METHOD OF PILING WOODEN TUBS OF BUTTER  
ILLUSTRATION NO. 8

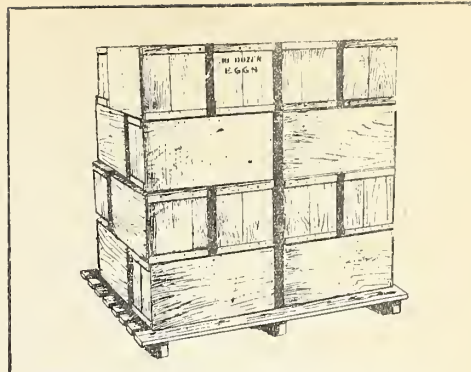


CORRECT METHOD OF PILING CRATED CAYS OF LARD  
ILLUSTRATION NO. 9

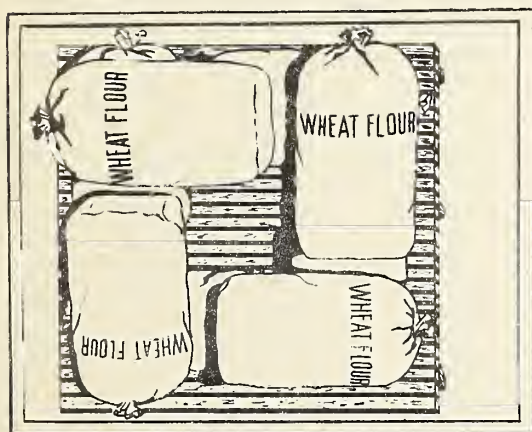




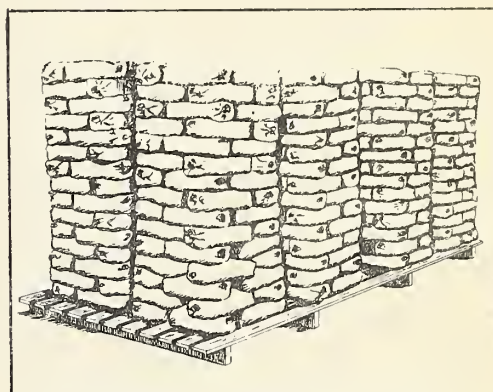
DETAIL OF CORRECT PILING FOR #10 CANS FOR AERATION, INSPECTION AND SAFE PILING. NOTE 'TIE-IN' OF CANS.  
ILLUSTRATION NO. 10



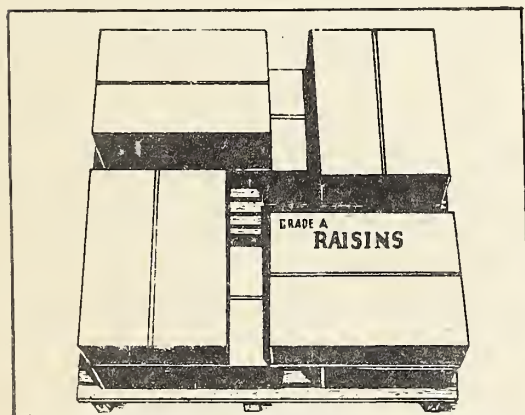
CORRECT METHOD OF PILING CASES OF SHELL EGGS.  
ILLUSTRATION NO. 11



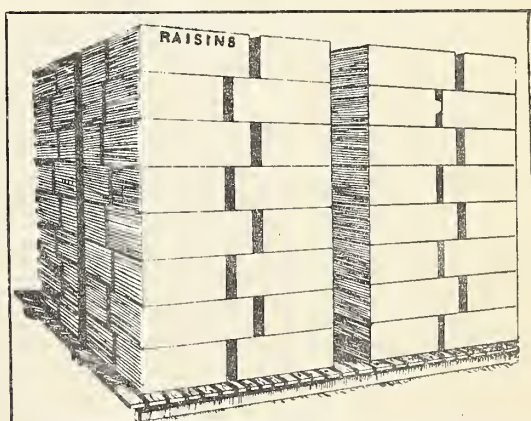
DETAIL OF CORRECT CHIMNEY STYLE PILING OF 12 1/2# AND OR 25# SACKS FOR AERATION AND SAFE PILING. NOTE 'TIE-IN' OF SACKS  
ILLUSTRATION NO. 12



COMPLETED STACK OF 12 1/2# AND OR 25# SACKS.  
ILLUSTRATION NO. 12-A



DETAIL OF CORRECT CHIMNEY STYLE PILING OF BOXED RAISINS FOR AERATION AND SAFE PILING. NOTE 'TIE-IN' OF BOXES.  
ILLUSTRATION NO. 13



COMPLETED STACK.  
ILLUSTRATION NO. 13-A

## 7. WAREHOUSE STOCK CONTROL

The warehouse manager should maintain an accurate and currently posted stock control ledger, and stock locator carrying the following information:

- (a) Date placed in warehouse.
- (b) Quantity.
- (c) Date of pack.
- (d) Location in the warehouse--floor, section, bay, bin, etc.
- (e) If evaporated milk, the date last turned.
- (f) Date last inspection for infestation, restacking, etc., and date last treated with insecticide.
- (g) Any special care instructions.
- (h) Document file of outgoing and incoming shipments.
- (i) Record of inventory adjustment due to loss by spoilage, theft, etc.

A suggested inventory control card follows:

### FRONT

COMMODITY _____		This item to be inspected on (date) _____		
SECTION (6)/(32) _____				
TYPE OF PACK _____				
PRODUCERS OR PACKERS NAME: _____				
SPECIAL CARE REQUIRED	DATES INSPECTED	INSPECTOR INITIAL	DATES TREATED WITH INSECTICIDE OR RESTACKED	INITIAL

### BACK

COMMODITY _____								
RECEIVED				SHIPPED			BALANCE ON HAND	
DATE	AMOUNT	D/O OR TICKET	WAREHOUSE LOCATION	DATE	AMOUNT	TICKET NO. OR LOSS CERTIFICATE	DATE	AMOUNT

NOTE: Inventory Adjustment, showing loss, will be recorded on above form, as "shipped". The "Loss Certificate" serves as the valid document to support the adjustment. See section 8 of Part III.

## 8. INFESTATION AND RODENT PROTECTION

- (a) **Spraying.** During spring, summer and fall seasons, it is recommended that warehouses be sprayed at regular intervals with an effective insecticide. Many good sprays are available but care must be taken in choosing a spray to make sure it is compounded from a formula which will not contaminate food. Sprays, other than DDT, are distinguished from fumigants in that it is necessary to have the droplets of liquid come in contact with the insect in order to get a kill. Since sprays other than DDT must make this contact, it is necessary to produce a fog of spray which will last long enough to penetrate cracks and crevices in floors, walls, etc. Walls and ceilings sprayed with a DDT solution will remain deadly to any fly, gnat or mosquito that lights on or crawls over them. This property of killing through the poison having contact with the insect's feet is what makes DDT of peculiar value as an insecticide. Caution is required in use of this poison, however, because it has been shown that DDT is toxic to animals when absorbed through the skin from an oil solution or emulsion and *when eaten in food*. Before applying any insecticide, ALL exposed food should be removed or carefully covered. Table tops, retorts, steam-jacketed kettles, and other food handling equipment should never be sprayed. Cold water pipes above work tables and processing equipment should not be sprayed, since water containing insecticide and condensed on the pipes might drip into exposed food. Food being prepared and processed should be protected from flies and other insects which may fall upon it after being overcome by the delayed action of DDT.

The best protection against flying insects is to kill them before they enter the place where food is handled. Clean up the breeding places first. Spray garbage cans and their covers inside and outside. Good places for DDT poison are screen doors and windows. Apply insecticide here with a coarse concentrated spray, or with a brush.

- (b) **Fumigation.** Fumigation of stock or building should not be undertaken except under the supervision of an expert in such work. Commercial fumigation is recommended when commodities require the use of fumigants.
- (c) **Rodent Control.** Rats and mice are not only destructive, but are carriers and transmitters of such diseases as typhus fever, cholera, tuberculosis, bubonic plague, hoof and mouth disease, and rabies. The most successful means of controlling rodents is preventive. Rat-proof all buildings where food is to be stored. If rats or mice are in a building, steps must be taken to eradicate them. Poison is dangerous to use around food storerooms, and cats have not been found very effective. Traps can be effective, but must be baited with some more attractive food than that stored in the affected area. Commercial exterminator organizations should be consulted for rodent elimination.



9. HANDLING COMMODITIES THAT HAVE BECOME UNFIT FOR HUMAN CONSUMPTION

Despite all normal precaution, food may become unfit for human consumption while in storage. When commodities are found to be damaged they should be quickly separated from undamaged articles as infestation, mold, etc., may rapidly spread from spoiled to unspoiled food. After bulk segregation they should be more carefully examined for possible salvage, and all edible food returned to storage. An authorized representative of the agency should then inspect the damaged items and complete a loss certificate using a form similar to the following:

WAREHOUSE LOSS CERTIFICATE

Date \_\_\_\_\_

Certificate No. \_\_\_\_\_

We hereby certify that during the period \_\_\_\_\_ to \_\_\_\_\_, the commodities listed below became unfit for human consumption through spoilage, infestation, or other causes beyond our control as follows:

WAREHOUSE	COMMODITY	QUANTITY	CAUSE OF LOSS	DISPOSITION
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....

\_\_\_\_\_ Distributing Agency

By \_\_\_\_\_  
Authorized Agent

The above form should be completed in duplicate. The warehouse management should keep one as a credit document against its inventories, and forward the other copy along with the monthly report forms to the record keeping office of the agency. After food has been certified to be unfit for human consumption, it may be disposed of in accordance with existing State Law and local ordinance.

10. DISPOSAL OF CONTAINERS

Commodity containers are donated by the USDA along with their contents, but agencies are expected to use such containers; (a) in the redistribution



or storage of commodities, or (b) sell them, applying proceeds to improved State distribution facilities. Should either the distributing or recipient agencies sell containers, they shall be particularly careful not to interfere with the manufacture or sale of similar containers. Agencies selling containers shall permit audits of their accounts to show that proceeds of sale were properly used. Under terms of the agreements between distributing agencies, sponsoring or recipient agencies, and the USDA, containers become the responsibility of the distributing agency and will be disposed of in accordance with instructions prescribed by the distributing agency.

## 11. GENERAL STORAGE SUGGESTIONS

The seven major causes of damage or deterioration of any item of subsistence during storage are:

- (a) Improper Handling
- (b) Insects and Rodents
- (c) Bacteria
- (d) Mold
- (e) Temperature
- (f) Foreign Odors
- (g) Moisture or Relative Humidity

Of these factors, temperature has recently received particular attention. This is because it has been shown that many canned or packaged commodities, although remaining fit for human consumption, will when stored under higher temperatures, rapidly lose vitamin quality. For example, orange juice concentrate stored at 40° F. for about 3 months retains approximately 99% of its vitamin C; at 80° F. it retains in same period 62%; and at 100° F. in a similar period it only retains about 8% of its valuable vitamin content. *It is highly recommended therefore, that all foods stored over a few months be kept at lower temperatures as shown on storage charts.* Other factors to be considered in safe storage of commodities vary considerably and to assist warehouse operators to follow the best established procedure, a list of commonly used commodities with as much detailed information as can be given, is included in Part V. This information includes the accumulated experience of commodity and warehouse specialists but will be subject to change to suit local conditions.

## 12. WAREHOUSE INSPECTIONS

Distributing agencies are required to make such inspections of their warehouses as are consistent with good operating practice. An accredited representative of the USDA may also inspect these warehouses at any reasonable time. All commodities, except those packed in cans, or glass, should be inspected at least once each week. Special attention should be given to inspecting the ears and sewed seams of sacks for insect larvae, cocoons, or other signs of infestation. Samples of all stock picked at random should be opened and inspected thoroughly.

Perishable and semi-perishable commodities should be inspected at least twice each week, and before each distribution. At time of each inspection, all decaying commodities etc., should be removed and disposed of as per paragraph (8) above. A sample warehouse check list follows on the next page.

(FRONT)

### SUGGESTED WAREHOUSE CHECK LIST

Distributing Agency \_\_\_\_\_ Date \_\_\_\_\_

Persons present during inspection and their official capacity \_\_\_\_\_

1. Location \_\_\_\_\_
2. Type: Fireproof \_\_\_\_\_ Semi-fireproof \_\_\_\_\_ Frame \_\_\_\_\_ Other \_\_\_\_\_
3. Number usable floors \_\_\_\_\_ Elevators \_\_\_\_\_ Is Basement used \_\_\_\_\_ Is it dry \_\_\_\_\_ ventilated \_\_\_\_\_
4. General appearance of building and locality \_\_\_\_\_
5. Facilities: Railroad platform \_\_\_\_\_; Truck platform \_\_\_\_\_; Distance to nearest team track \_\_\_\_\_; other shipping or receiving facilities \_\_\_\_\_
6. Number railroad cars that can be loaded \_\_\_\_\_; unloaded \_\_\_\_\_ each day.
7. Tonnage that can be loaded \_\_\_\_\_; unloaded \_\_\_\_\_ each day from trucks.
8. Capacity of warehouse: \_\_\_\_\_  
Dry Storage: \_\_\_\_\_ Cold Storage: \_\_\_\_\_
9. Burglary protection: Watchman \_\_\_\_\_; Alarm \_\_\_\_\_; Strong doors \_\_\_\_\_; Barred windows \_\_\_\_\_; Other \_\_\_\_\_
10. Fire protection: Sprinklers \_\_\_\_\_; Hose \_\_\_\_\_; Alarm \_\_\_\_\_; Hand Extinguishers \_\_\_\_\_. When was fire equipment last inspected by underwriters or fire marshall \_\_\_\_\_ Other fire protection \_\_\_\_\_
11. Heating system: Type \_\_\_\_\_; Is it adequate \_\_\_\_\_; Automatic control \_\_\_\_\_; Comment \_\_\_\_\_
12. Measuring apparatus: Comment \_\_\_\_\_; Type of scales \_\_\_\_\_; Dry and liquid measures \_\_\_\_\_; Other \_\_\_\_\_; When were scales last tested \_\_\_\_\_
13. Ventilation: Comment \_\_\_\_\_; Fans \_\_\_\_\_; Temperature control \_\_\_\_\_; Is ventilation adequate \_\_\_\_\_
14. Lighting: Type \_\_\_\_\_; Is it adequate \_\_\_\_\_; Comment \_\_\_\_\_
15. Materials handling equipment: Comment \_\_\_\_\_; Fork lift trucks \_\_\_\_\_; Pallets \_\_\_\_\_; Tractors \_\_\_\_\_; Roller platform \_\_\_\_\_; Other \_\_\_\_\_; Describe \_\_\_\_\_  
Are all commodities or dunnage four inches from floor \_\_\_\_\_
16. Cleaning equipment and material: Comment \_\_\_\_\_; Where stored \_\_\_\_\_; How often are commodities treated with insecticide \_\_\_\_\_; How often is warehouse swept \_\_\_\_\_; What action taken to eliminate rodents \_\_\_\_\_
17. Appearance: Excellent \_\_\_\_\_; Good \_\_\_\_\_; Fair \_\_\_\_\_; Dirty \_\_\_\_\_; Other \_\_\_\_\_
18. Stacking: Excellent \_\_\_\_\_; Good \_\_\_\_\_; Fair \_\_\_\_\_; Honey Combing \_\_\_\_\_; Stack corner guards \_\_\_\_\_; Sufficient aisle space \_\_\_\_\_; Commodities easily identified \_\_\_\_\_; Stacks too high \_\_\_\_\_; Comment \_\_\_\_\_
19. Bookkeeping: Accurate \_\_\_\_\_; Current \_\_\_\_\_; Adequate \_\_\_\_\_; Is the "Control system" in use for allocation of space \_\_\_\_\_; Location of commodities \_\_\_\_\_
20. Personnel: Office \_\_\_\_\_; Storeroom \_\_\_\_\_; Janitor \_\_\_\_\_; Labor \_\_\_\_\_; Other \_\_\_\_\_; Comment \_\_\_\_\_

(BACK)

21. Commodities in Storage

TYPE	PACK QUANTITY	DATE RECEIVED	DATE LAST INSPECTION	DATE LAST INSECTICIDE TREATMENT	CONDITION
(1)					
(2)					
(3)					
(4)					
(5)					
(6)					
(7)					
(8)					
(9)					
(10)					
(11)					
(12)	(Attach continuation of this list if necessary)				

Approximate value Section 32 items \_\_\_\_\_; Section 6 items \_\_\_\_\_  
\_\_\_\_\_ ; General remarks concerning paragraph 21  
(Comments for improvement) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

22. Record of inventory adjustment, due to spoilage, since last inspection:

COMMODITY	QUANTITY	REASON FOR LOSS	DISPOSITION OF COMMODITY
(Attach continuation of this list if necessary)			

23. Record of inventory adjustment due to pilferage or burglary since last inspection \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

24. Temperature of warehouse at time of inspection: Basement \_\_\_\_\_; 1st  
floor \_\_\_\_\_; 2nd floor \_\_\_\_\_; Other floors \_\_\_\_\_

25. Formal recommendations and comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

26. Inspectors Signatures: \_\_\_\_\_



## PART IV. SHIPPING SUGGESTIONS

### 1. GENERAL

The USDA will ship commodities in railroad car lots without expense to the distributing agency to designated receiving points within the agency's area of operation. At discretion of USDA less than RR carload lots (split shipments) may be distributed either by RR or truck, prepaid to such receiving points. After reception of commodities by the distributing agency or its sub-agent, the cost of further distribution of commodities is undertaken by arrangement between agencies receiving the shipments.

### 2. REPACKING EQUIPMENT AND PERSONNEL

The warehouse packaging room should be separated from the regular storage space. The room should be kept conspicuously clean and all equipment, bins, tables, etc. should be scrubbed and cleaned after each usage. Light should be abundant. Adequate ventilation and heat should be provided.

Employees engaged in packaging operations should be required to be personally clean and neat in appearance and meet all local and State health standards and requirements. They should be required to wear uniforms or aprons and headgear. Women should wear headbands and men, caps or hats. Tobacco should not be permitted in the packaging room.

Standard-sized paper bags and cartons should be used for packaging commodities. Each package should be sealed or stapled and otherwise present a neat appearance. Packages should be identified as to type of commodity and quantity. Old stock should be packaged first and new shipments of the same commodity withheld for future use. Packaging should not exceed current needs, as commodities deteriorate more rapidly in packages than in original containers.

### 3. DOCUMENTARY CONTROL, OUTGOING SHIPMENTS

Distributing agencies, whether using their own trucks, recipient agency trucks, or commercial trucks must carefully handle outgoing shipments. All items shipped from a warehouse or carload distribution point, should be listed on shipping tickets or unloading tally sheets. These forms should be signed for by truck driver and using agency when received to guarantee that correct quantities (1) are credited to warehouse inventory control ledgers and (2) to assure that using agency actually receives the commodities. They should be prepared in triplicate in warehouse or central records office. One copy should be retained, second copy mailed to recipient agency, and third copy sent with shipment. The recipient agency keeps third copy for its records and mails back second copy (signed) to warehouse or central records office where it becomes a valid document supporting the issue.

#### 4. SUGGESTED "SHIPPING TICKET"

A suggested form of shipping ticket is reproduced below. Under remarks, an explanation of the situation should be entered. For example: the truck may have been delayed, and contents damaged through no fault of driver. Shortage may be due to pilferage. Overage may explain a shortage elsewhere. Damage may occur because of improper packing or because of truck being used without cover in hot sun or rain. Time of arrival should always be noted.

#### SUGGESTED SHIPPING TICKET

From: _____ (Name of Distributing Agency)	Date: _____
To: _____ (Name of Using Agency)	
We have as of _____ (hour) _____ (date) shipped the following food to you in good condition:	
FOOD (List Foods)	TYPE OF PACK QUANTITY EXCEPTION AS TO CONDITION
Carrier: _____	Truck License No. and State _____
Driver's Name _____	Driver's License No. _____
I hereby acknowledge that items listed above were received by me at time stated and in condition indicated.	
(Driver): _____	

#### REVERSE SIDE - SUGGESTED SHIPPING TICKET

We hereby acknowledge receipt of items listed on reverse side of this shipping ticket in quantities and condition as indicated at _____ hour, _____ date.			
_____ Authorized Representative of Using Agency			
OVER, SHORT OR DAMAGE REPORT			
We hereby acknowledge receipt of items listed on reverse side of this shipping ticket in quantities and condition indicated with following exceptions which have been brought to the attention of the driver at _____ hour _____ date.			
FOOD (List Exceptions)	TYPE OF PACK	QUANTITY	CONDITION
Remarks: _____		_____ Authorized Representative of Using Agency	



## PART V. DETAILED STORAGE REQUIREMENTS, COMMONLY USED COMMODITIES

This section contains detailed storage information covering many commonly used foods, including all Section 32 or Section 6 commodities distributed by the USDA in the past two years. The first 16 items are groupings of similar foods - for example: "Meats" include beef, pork, lamb, etc.; "Fats and Oils" include vegetable oils, mayonnaise, lard, etc. The remaining items cover specific foods such as apples, potatoes, etc. Section 32 commodities are marked with asterisk (\*); Section 6 items are marked with double asterisk (\*\*). Items marked with (X) are covered in detail on separate pages. For information concerning commodities not included in this section, or not covered in sufficient technical detail, please communicate with the Area Field Supervisor, Food Distribution Programs Branch, Production and Marketing Administration, United States Department of Agriculture.

1. Beverages
2. Canned Fruits and Vegetables
3. Cereals and Cereal Products
4. Dairy Products
5. Dehydrated Foods
6. Dried Fruits
7. Eggs and Poultry
8. Fats and Oils
9. Fresh Fruits and Vegetables
10. Fresh Citrus Fruits
11. Meat
12. Meat (Variety) and Fish
13. Miscellaneous - Baking Powder, Yeast, Pickles, Relish
14. Nuts
15. Seasoning Agents
16. Sugar, Honey, Jam, Molasses, Chocolate, Syrup
17. Apples
18. Cabbage
19. Dry Beans - Onions
20. Orange Juice - Concentrate
21. Pears
22. Potatoes
23. Sweet Potatoes

# I - BEVERAGES

PRODUCT	PACKAGING	APPROXIMATE KEEPING TIME			DANGEROUS STORAGE CONDITIONS
Cocoa Breakfast Beverage Powder	Bags Cartons Fiber Cans Metal Cans	40°F	70°F	90°F	Open Containers Temperature above 100° F.
		Indef- initely	60 Mos.	12-24 Mos.	
Chocolate Drink Powdered	Vacuum Pack	24 mos.	12 mos.	3 mos.	ditto
Coffee Roasted (ground and unground) Soluble	Bulk - opened containers	50° F. to 60° F.			Above 60°F and 70% relative humidity Loses strength if stored above 40°F
		15 days at 70% rel- ative humidity			
	Closed cans  Cans or Glass	40°F	70°F	90°F	Temperature above 100°F.
		1 yr 4 yr	8 mos 2 yr	5-6 mos. 1 yr	
NOTE: The desirable properties of flavor, odor and taste in the above prod- ucts often are dependent upon very unstable and volatile constitu- ents, and deterioration actually may result from a loss or breakdown of one or more of these constituents. However, excessive heat and moisture, contamination by insects, rodents, microbiological orga- nisms, dirt and dust, and inadequate packaging can be major factors contributing to deterioration.					
Juice Powder Lemon	Metal Tins cased in solid fiber	40°F	70°F		Extreme heat, cold, and moisture.
		24 mos.	6-12 mos.		
Juice Lemon	30-Gal kegs 50-Gal kegs	32°F	50°F		
		12 mos.	4-6 mos.		
Juice Orange (X)	Tins, gal. cans, fiber cases	40°F	70°F		Freezing. Refer to remarks on canned fruits (A)
		24 mos.	12 mos.		
(a) Should be stored in a dry, well ventilated place. Storage in direct sunlight should be avoided in mild or hot climates, as increased heat caused by solar radiation may raise the temperature of the cans above 100° F.					
Tea	Paper Bags Sealed wooden chests Metal cans	40°F	70°F	90°F	Below 50% or above 80% relative humidity at temperatures above 90°F. Keep out of sun and dry. Away from odors of all kind.
		5 yrs	2-3 yrs	1-2 yrs	

## 2 - CANNED FRUITS AND VEGETABLES

GROUP	APPROXIMATE KEEPING TIME		
	40°F.	70°F.	100°F.
<b>GROUP I</b> BEANS (**) (*) (All Varieties) CARROTS (**) (*) CORN PEAS	72 mos.	36 mos.	18 mos.
<b>GROUP II</b> ASPARAGUS BEETS (**) (*) BRUSSELS SPROUTS CABBAGE CAULIFLOWER POTATOES, sweet (*) POTATOES, white SPINACH	60 mos.	12 mos. (or More)	9 mos.
<b>GROUP III</b> APPLES APPLESAUCE FIGS (*) PEACHES (**) (or PEARS PINEAPPLE (**) (*)	36 mos.	12 mos. (or More)	9 mos.
<b>GROUP IV</b> PUMPKINS SAUERKRAUT (*) SQUASHES TOMATOES (**)	30 mos.	12 mos.	6 mos.
<b>GROUP V</b> APRICOT NECTAR APRICOTS (*) BERRIES (All Varieties) CHERRIES FRUIT SALAD GRAPEFRUIT GRAPEFRUIT JUICE (*) GRAPES ORANGE JUICE (*) PLUMS RAISINS (*) RHUBARB TOMATO JUICE (**) (or TOMATO PUREE (**)	18 mos.	12 mos.	3 mos.

Storage should not exceed 100°F. to avoid chemical and bacterial spoilage and loss of Vitamin Quality. To avoid freezing, do not store at below 30°F.

Canned fruits and vegetables should be stored in a dry, well-ventilated place. Storage in direct sunlight should be avoided in milk or hot climates, as increased heat caused by solar radiation may raise the temperature of cans above 100° F.

### 3 - CEREALS AND CEREAL PRODUCTS

PRODUCT	PACKAGING	APPROXIMATE KEEPING TIME			DANGEROUS STORAGE CONDITIONS
Barley	Cartons Cloth Bags	40°F	70°F		Dampness, Lack of air circulation
		24 mos.	12 mos.		
Corn Meal Degerminated Whole ground	Cartons, Cloth Bags, Laminated & Paper Bags bur- lap bags, cans	12 mos.	8 mos.		High temperatures Dampness, Lack of air circulation
		8 mos.	3 mos.		
Flour	Cotton Bags, Domestic Paper Bags	10-12 mos. 6-8 mos.			Approximate keeping time is based on a relative humidity of 60%. Relative humidity greater than 70% is likely to result in musti- ness.
Oats Rolled	Cartons, As- phalt-Laminat- ed bags Cans	36 mos.	24 mos.		As above
Macaroni Products: Macaroni and Spaghetti	Corrugated fibre-board cartons	40°F	70°F	90°F	Cereal products are subject to deteri- oration or damage from moisture, high temperature, infes- tation, and absorp- tion from other products. These items should be stored on racks or dunnage in a moder- ately cool dry place at an approx. temp. of 70°F, and a relative humidity of 60%
		36 mos.	24 mos.	18 mos.	
Noodles	Corrugated fibre-board container	36 mos.	24 mos.	9 mos.	Same as above
Rice	Burlap Bags Osnaburg bags Multi-wall paper bags or boxes	40°F	70°F	90°F	Damp storage con- ditions. Long storage periods at high temperature
		12 mos.	4 mos.	2 mos.	

# 4 - DAIRY PRODUCTS

PRODUCT	PACKAGING	APPROXIMATE KEEPING TIME	DANGEROUS STORAGE CONDITIONS
Cheese Natural	Veneer Boxes Fibre boxes, Nailed wood boxes, Wood wirebound boxes	<del>40°F 70°F 90°F</del>	Conditions other than those recom- mended are consid- ered dangerous for long holding periods
		Natural cheese should be stored at a temperature range of 30°F-36°F with a relative humidity of 70-80%. Air should be kept in circula- tion.	
Cheese Processed (**)	Hermetically sealed cans	40°F 70°F 90°F	Below 30°F and above 100°F
		24 mos. 12 mos. 4 mos.	
	Paper carton, wood box - metal foil	32°F 50°F 12 mos. 6 mos.	
Milk Evaporated	Domestic cases <sup>1</sup>	40°F 70°F 90°F	Below 30°F and above 100°F
		24 mos. 12 mos. 3 mos.	
Milk Condensed	Cans Export Cases	24 mos. 12 mos. 3 mos.	Below 30°F and above 100°F
Milk Dried (**) Nonfat Solids	Barrels with dou- ble liners, Ply- wood drums, 2 liners, Fibre drums 6-4½ or 5 tins - Domestic case	24 mos. 12 mos. 3 mos.	Above 100°F Keep as dry as pos- sible with relative humidity below 35%.
Milk Dried Whole	Hermetically sealed cans Export cases	24 mos. 12 mos. 4 mos.	Above 100°F Product should be stored away from heat at normal room tempera- ture
Butter Fresh	Prints generally in 32# cartons Bulk in fiber containers of 30-60 lb. each Tubs Wooden Boxes	45°F 0° or below	Any temperature above 50°F. Excessive Moisture
		2 mos. 3-10 mos.	
Butter	No. 10 can usually	12-15 mos.	Temperature above freezing point

<sup>1</sup> Milk packed in domestic cases should be turned every 60 days.



## 5 - DEHYDRATED FOODS

General. Dehydrated foods are fresh foods scientifically preserved under precisely controlled methods of drying. All inedible portions are removed. The finished product is powdered, or subdivided into slices, cubes, strips, flakes, shreds or other forms. By dehydration, the preponderance of water in fresh foods is reduced to an extremely low content. Present-day dehydrated foods retain much of the natural flavor, color and texture of the fresh food. Dehydrated foods retain much of their nutritive value - but, if stored for long periods, appreciable amounts of vitamins will be lost and this is especially true if the storage temperature exceeds 60° F.

Keeping Qualities. If held in airtight and insect-proof containers and stored at moderate temperatures, dehydrated foods will keep for extended periods of time. Many foods will keep up to 2 years. Dehydrated foods remain in a state of preservation primarily because of their low moisture content. The microorganisms responsible for spoilage (yeast, molds and bacteria) commonly present in foods are unable to carry on their usual activities when the water residue is sufficiently low. Some of these organisms are killed by the dehydrating processes, but the others remain dormant in the dehydrated foods, only to renew their activities at a later time when water is restored.

PRODUCT	PACKAGING	APPROXIMATE KEEPING TIME				DANGEROUS STORAGE CONDITIONS
		35°F	65°F	80°F	100°F	
Beets .....	Cans .....	14 to 18 mos.	13 to 18 mos.	6 to 9 mos.	3 to 4 mos.	100°F or above
Cabbage .....	Cans .....	15 to 20 mos.	10 to 15 mos.	8 to 12 mos.	4 to 6 mos.	ditto
Carrots .....	Cans .....	14 to 18 mos.	8 to 12 mos.	6 to 9 mos.	3 to 4 mos.	ditto
Chicken Soup (*) ..	Cans .....	14 to 18 mos.	6 to 8 mos.	4 to 6 mos.	3 mos.	ditto
Hominy .....	Cans .....	18 to 24 mos.	13 to 18 mos.	8 to 12 mos.	3 to 4 mos.	ditto
Onions .....	Cans .....	18 to 24 mos.	15 to 20 mos.	8 to 12 mos.	4 to 6 mos.	ditto
Potatoes, sweet ...	Cans .....	18 to 24 mos.	13 to 18 mos.	8 to 12 mos.	4 to 6 mos.	ditto
Potatoes, white ...	Cans .....	18 to 24 mos.	13 to 18 mos.	8 to 12 mos.	4 to 6 mos.	ditto
Rutabagas .....	Cans .....	14 to 18 mos.	8 to 12 mos.	6 to 9 mos.	3 to 4 mos.	ditto
Tomatoes (*) (Flakes) .....	Cans .....	14 to 18 mos.	6 to 8 mos.	4 to 6 mos.	3 mos.	ditto



# 6 - DRIED FRUITS

PRODUCT	PACKAGING	APPROXIMATE KEEPING TIME			DANGEROUS STORAGE CONDITIONS
		35°F	70°F	100°F	
Apples (*) .....	.....	30 mos.	16 mos.	5 mos.	Damp basements with high relative humidity
Apricots .....	.....	18-24 mo	8-12 mo	2-3 mo	
Dates (raw) .....	.....	8-12 mo	1-2 mo	2 wks	
Dates .....	.. 25 lb. wooden boxes, paper cartons and wax-dipped cartons	8-12 mo	8-12 mo	4-6 mo	Temperature above 70°. Relative humidity above 80%.
Figs (*) .....	.....	24-30 mo	12-16 mo	4-6 mo	Storage near grain or cereal products. Unscreened Whse's.
Peaches (*) .....	.....	18-24 mo	8-12 mo	3-4 mo	
Pears .....	.....	24-30 mo	12-16 mo	4-5 mo	
Prunes (*) .....	.....	24-30 mo	18-24 mo	7-8 mo	
Raisins (*) .....	.....	24-30 mo	12-16 mo	7-8 mo	

Dried fruits are held both in cold storage and in ordinary warehouse storage. A relative humidity of 55 percent has been found most satisfactory. If stored in dry storage, the packages should be stacked closely together to prevent excessive drying out. Rooms should be darkened and well-screened to prevent entrance of insects and rodents. In cold storage, temperature and relative humidity are more easily controlled, and vermin are usually held in check or kept out entirely by the low temperature. At least two-inch dunnage should be used in all cooler rooms.

Dried fruits properly packed will keep for several months in excellent condition under proper storage and handling procedure. However, it must be remembered that dried fruits are a semi-perishable product, and are subject to damage by excessive heat, or moisture, and insects, as well as mold germs which are everywhere present in the atmosphere. It is, therefore, of the utmost importance that proper care be used in handling their storage. All dried fruits should be regularly inspected so that damaged items can be removed before they contaminate good fruit.

**Mold.** If small spots of mold are found in a box of fruit, the spot should be carefully removed together with a substantial amount of sound fruit adjacent to the infected area.

**Infestation:** Dried fruits that become contaminated from insects may be cleaned under certain conditions. Apply to the U. S. Dept. of Agriculture for detailed information concerning cleaning methods.

No attempt should be made to salvage fruit that has been damaged seriously by any type of mold, yeast, or insect. Such fruit should be destroyed immediately

# 7 - EGGS AND POULTRY

PRODUCT	PACKAGING	APPROXIMATE KEEPING TIME	DANGEROUS STORAGE CONDITIONS
Eggs Frozen	Cans Fiber Drums	Indefinitely without decomposition at 0°F-15°F. (after being frozen at from 50°F-10°F.) (Some States prohibit storage of frozen eggs for more than 12 Mos.)	Unsanitary or dirty storage rooms. Overloaded freezers. Fluctuating temperatures. Improper stacking. Presence of strong odors. Stacking containers tightly within 72 hours after starting to freeze.
Eggs (*) Powdered Whole	Fiber containers, cans, barrels, wooden boxes, metal drums, plywood drums	<div>40°F                      70°F</div> <div>12 mos.                  6 wks.</div> <div>With relative humidity 40%.</div> <div><i>65</i></div> <div><i>6 mos 6 weeks.</i></div>	<del>50</del> Above 60% humidity. Exposure to odoriferous materials (pungent and volatile odors). Wet floors. Improper air circulation. Unsanitary conditions.
Poultry Canned	Hermetically Sealed cans	Indefinitely as long as there are no leaks.	Excessive temperatures.
Poultry Frozen	Wooden boxes, fiber boxes, barrels	About 8 mos. at 0°F-10°F (after quick freezing).	Too little moisture. Too high temperatures. Contamination. Chemicals such as ammonia from leaks in refrigeration facilities. Rodent infestation.
Eggs Shell	Fiber Cases, Wooden and Wirebound Cases containing new flats or egg cartons	6-8 mos. at 28°F.-31°F. Storage should be at 30 with an allowable fluctuation of plus or minus 1°. Should be between 92% and 94% relative humidity.	Unsanitary or dirty storage rooms. Temperatures fluctuating more than 1°F. Insufficient air movement. Too little moisture. Too high temperatures. Fiber cases stacked more than 6 cases high. Uneven stacking. Odors from fruits, vegetables, fish, etc.

# 8 - FATS AND OILS

PRODUCT	PACKAGING	APPROXIMATE KEEPING TIME				DANGEROUS STORAGE CONDITIONS
		34°F	50°F	75°F	100°F	
Vegetable Salad Oil	Cans	12 Mos.	9 Mos.	5 Mos.	2 Mos.	Above 100°F.
Vegetable Oils Crude or Refined Linseed Soybean Cotton- seed Sunflower Seed Peanut	Drums Barrels Bulk	3-5 Mos. no special conditions of temper- ature or relative humidity are required. Recommended storage period: Bulk - 3 Mos., packages - 6 mos.				
Lard Pork Fat Rendered Refined		35°F - 40°F. or lower				
Shortening	Cans Cartons	3 mos. 45 days				
Mayonnaise French Dressing	All types	45°F to 50°F				Over 70°F or under 30°F. - storage in sun- light
		6 to 10 months				
Peanut Butter (**)	Glass jars metal cans	40°F to 80°F				Above 90°F or storage in sun- light of PB packed in glass
		1 to 2 years				

# 9 - FRESH FRUITS AND VEGETABLES

COMMODITY	FREEZING POINT	IF STORED AT:		USUAL STORAGE PERIOD
		TEMPERATURE (F.)	RELATIVE HUMIDITY (PERCENT)	
APPLES (*) (x)				
APRICOTS	28.1	31-32	80-85	2-3 wks.
BEANS				
GREEN OR SNAPS (*)	29.7	32-36	85-90	3-4 wks.
LIMA	30.1	32-36	85-90	3-4 wks.
DRY (x)				
BEETS (*)				
TOPPED	26.9	32-34	90-95	1-3 mos.
BUNCH	-	32-34	85-90	1-2 wks.
CABBAGE (x)				
CARROTS (*)				
TOPPED OR BUNCH	29-6	32-33	90-95	4-6 mos.
CAULIFLOWER	30.1	32-33	85-90	2-3 wks.
CELERY UNWASHED	29.7	31-32	90-95	3-4 wks.
CELERY WASHED	29.7	33	90-95	3-4 mos.
CHERRIES				
SOUR	28.0	31-33	80-85	10-20 days
SWEET	24.5	31-33	80-85	10-20 days
CUCUMBERS	30.5	38-40	80-90	10 days
CORN, GREEN	28.9	31-32	85-90	1-2 wks.
CRANBERRIES	27.3	32-33	85-90	1-4 mos.
GRAPEFRUIT (x)	28.4	32-33	85-90	6-8 wks.
GRAPES				
VINIFERA	24.9	31-33	85-90	4-6 mos.
AMERICAN	27.5	31-33	80-85	3-4 wks.
LETTUCE	31.2	32-34	90-95	3-4 wks.
LEMONS (x)				
LIMES	29.3	40-58	85-90	6-8 wks.
ONIONS (x)	30.1	32-33	70-75	5-8 mos.
ORANGES (x)	27.5	32-36	85-90	8-10 wks.
PEACHES	29.4	31-33	80-85	3-5 wks.
PEARS (x)				
PEAS (GREEN)	30.0	32-33	85-90	1-3 wks.
PLUMS	28.0	31-32	80-85	2-3 wks.
POTATOES (x)				
PRUNES	28.0	31-33	80-85	1-2 wks.
RHUBARB	28.4	32-33	85-90	3-4 wks.
RUTABAGAS	29.5	32-33	90-95	2-4 mos.
SAUERKRAUT	-	31-32	80-85	3-6 mos.
SPINACH (*)	30.3	32-33	90-95	7-10 days
SQUASH	29.3	50-55	70-75	2-6 mos.
SWEET POTATOES (x)				
TOMATOES (Ripe)	30.4	40-50	85-90	7-10 days
TOMATOES (Green)	30.4	55-60	85-90	1-6 wks.
TANGERINES	28.0	32-33	80-85	1-3 mos.
TURNIPS	30.3	32-33	90-95	2-4 mos.
WATERMELONS	29.0	36-50	75-85	2-3 wks.



## 1. STORAGE

Lemons, oranges, and grapefruit all require about the same storage procedure. Cold storage is recommended, the ideal storage temperature 38 to 40 degrees Fahrenheit, relative humidity 80 to 85 percent. Temperature should never be allowed to go below 30 degrees Fahrenheit. When cold storage is not available, ordinary storage may be used, a cool well ventilated room being the most desirable space. All citrus fruits are subject to both blue and green mold rot which is usually caused from bruises or high temperatures. Extreme care should be used in handling to prevent injuries, and a free circulation of air around the cases is essential in keeping down decay. Cases should be placed on end and on dunnage, not more than two high to prevent any possibility of the fruit becoming crushed. Regular inspection and sorting should be instituted in order to cull out the fruit which shows signs of decay and prevent its spreading to unaffected quantities. Lemons with buttons missing are poor keepers and should be distributed as rapidly as possible.

## 2. TEMPERATURE

Ideal storage temperatures for citrus fruits range from 38 to 40 degrees Fahrenheit with a minimum low of 30 degrees and a maximum high of 45 degrees Fahrenheit, relative humidity of 80 to 85 percent. Citrus placed in storage under these conditions before it becomes over ripe should keep safely for approximately 60 days; however, it is recommended that not more than a 30 days supply be stocked at any time.

# II - MEAT

PRODUCT	PACKAGING	APPROXIMATE KEEPING TIME			DANGEROUS STORAGE CONDITIONS
		40°F		70°F	
Bacon Processed in cans	Cans	60-72 mos. 48 mos.	36 mos. 24 mos.	Above 90°F ditto	
Meat Products (a) Containing Meat Alone in cans	Cans	32°F or below 60-120 mos.	40°F to 70°F 48-60 mos.	70°F to 100°F 24-36 mos.	Temperatures above 100°F for meat products containing fruit or vegetable constituents, and above 120°F. for products containing only meat, markedly hasten spoilage. Temperature fluctuations over a wide range above and below freezing affect items' texture, particularly for products containing fruit or vegetable constituents
Meat Products (a) Containing fruit or Vegetable Constituents beef, hash in cans	Cans	48-72 mos.	36-48 mos.	6-36 mos.	
Pork Cured Pickled	Boxes barrels bulk	6 Mos. at 10°F - 15°F			Above 15°F
Pork Cured Dry Salt	Same	Not over 3 mos. at 35°F - 40°F			Above 25°F
Pork Smoked Reg. Hams Skinned Hams	Same as Pork Cured Pickled	For 1 Mo. 10°F - 25°F  Not longer than 1 Mo., a maximum storage temperature of 15°F			ditto
Frozen Boneless Products (a)	Boxes barrels	Ideal temperature zero or below			Above 10°F
Beef Carcass, all grades Chucks Manufacturing Trims	ditto	ditto			ditto

(a) Includes Beef, Lamb, Veal, Mutton, Pork, etc.

# 12 - MEAT (VARIETY) AND FISH

PRODUCT	PACKAGING	APPROXIMATE KEEPING TIME	DANGEROUS STORAGE CONDITIONS
<u>Variety Meats</u> Frozen Kidneys Livers Hearts Brains	Tins Boxes Barrels	Recommended temper- ature zero or below	Above zero
<u>Fish</u> Cod (**) Herring Haddock (**) Pilchards Sardines in Oil Mackerel  Shrimp Crabmeat Sardines in Tomato Sauce or Mustard  Salmon and Tuna	Cans       Cans   Cans	40°F 70°F 100°F 48 16 12 Mos. Mos. Mos.      36 24 6 mos. mos. mos.  72 <sup>1</sup> 48 18 Mos. Mos. Mos.	Storage at other than most favorable temperatures
<u>Fish</u> Brine Pickled Dry Salted	Barrels Kegs	12 3 1 mos. mos. mo.	Failure to cover brine fish complete- ly with strong salt brine (50% to 60% salimeter) in tight barrels. Preferably to have storage at 40°F
<u>Fish</u> Mild Smoked Hard Smoked	boxes Boxes	6 wks. 10 days 6 mos. 1 mo.	
<u>Fish</u> Fresh Frozen (**) Wood or paper container, sometimes "Glazed" or covered with ice		below 0° 3 to 6 mos.	Temperature above 0°F Loss of glazed covering

\*\* A calculated figure. No experience at this temperature. Storage life might be considerably greater in some cases.

## 13 - MISCELLANEOUS (BAKING POWDER, YEAST, PICKLES, RELISH)

PRODUCT	PACKAGING	APPROXIMATE KEEPING TIME - MODERATE LOW TEMPERATURE & HUMIDITY		DANGEROUS STORAGE CONDITIONS
Baking Powder	Fibreboard cans	½ to 1 yr. under moderate conditions of temperature and humidity		Relative humidity above 60 percent
	Hermetically sealed cans	Unlimited		
	Metal containers with friction top or slip cover top	1 to 1½ yrs. under moderate conditions of temperature & humidity		Relative humidity above 60 percent
Baking Soda	Cartons	Unlimited		
Yeast, active, dry	Hermetically sealed metal cans	8 mos. at 40°F. 6 to 8 mos. at 70°F. 2 to 3 mos. at 90°F.		Temperature above 80°F.
Pickles: cucumber, dill	Cans, jars, kegs (genuine)	50°/70°F.	90°F.	
		4 to 6 mos.	2 to 3 mos.	
		8 to 10 mos.	4 to 6 mos.	
	Jars (imitation)	8 to 10 mos.	4 to 6 mos.	
	Cans (imitation)	12 mos.	6 mos.	
Cucumber, sour	Cans, kegs, jars	12/15 mos.	6 mos. Jars: 8 to 10 mos.	
Cucumber, sweet	Cans, jars, kegs	15 to 18 mos.	9 to 12 mos.	
Relish		12 to 15 mos.	6 mos.	



(Temperature, 32° to 50°F; relative humidity 65 to 75 percent)

Most of the commercial nut crop, including walnuts of all kinds, filberts, almonds, Brazil nuts, peanuts, and sometimes pecans, is usually held in ordinary warehouse storage through the winter following harvest. The portion of the crop (except pecans) that is to be kept through the following summer should be placed in cold storage early in March. Pecans become stale and rancid much sooner than most other kinds of nuts, and it is safer to put them in cold storage at 32°F shortly after harvest. Brazil nuts can usually be kept satisfactorily in warehouse storage during the winter, but that portion to be held over summer should be stored at 32° before warm weather. Brazil nuts should be carefully inspected before being accepted for storage to see that they are well dried out or cured. Walnuts, filberts, and almonds usually need not be stored below 40° to 45°. Chestnuts are rarely held in any other way than in cold storage at 32° to 40°.

Shelled and unshelled peanuts can be held at common warehouse temperature during the winter, but during spring and summer shelled peanuts should be kept in cold storage both for protection against insects and to prevent development of rancidity. If cold storage is not available, common storage can be used, but the peanuts should be stored in the shell, and shelled out as needed, because if stored shelled they are likely to darken and become rancid. In common storage care should be taken to prevent infestation by insects. Fumigation is desirable for both shelled and unshelled peanuts if they are to be held in common storage during the summer for any considerable time.

As all varieties of nuts keep better unshelled than shelled, it is usually the best practice to store nuts in the shell and crack them as needed unless the kernels can be sealed in a vacuum, which will permit them to be kept even longer than in the shell. Generally, nut kernels should be stored at 32° F.

The relative humidity of the storage room should be 65 to 75 percent. At higher humidities there is danger of mold growth, and at lower humidities there will be undue drying.

## 15 - SEASONING AGENTS

PRODUCT	PACKAGING	APPROXIMATE KEEPING TIME - MODERATE LOW TEMPERATURE & HUMIDITY	DANGEROUS STORAGE CONDITIONS
Condiment sauces: Chili sauce Hot sauces Tomato catsup Kitchen sauces Tomato catsup	Glass	below 60° 1 - 2 yrs	
	"	above 60° less than 1 yr	
	Cans	below 75° less than 6 mos.	
	"	90-100°F less than 6 mos.	
Flavoring extracts and agents: Liquid Tablets and powders	Glass bottles	Unlimited at 40°F	
	Chipboard boxes	Unlimited at 70°F	
	fibre or metal cans	More than 2 yrs at 90°F	
Salt: Tablets Granulated	Metal cans	Unlimited (not affected by temperature)	Relative humidity above 80% will cause caking unless protected by moisture resistance packing
	Cloth bags and cloth bags with multiwall paper bags	Avoid cellar storage or any "damp" storage condition	
Spices, Allspice: Ground Whole	Fiberboard cans & metal cans	1 year	
		5 yrs.	
Capsicum: Cayenne pepper Red pepper Paprika	ditto	6 months	
Cinnamon, ground	ditto	1 year	
Mustard, prepared	ditto	6 mos to 1 yr	
Nutmeats: Ground Whole	ditto	1 year	
		5 yrs.	
Pepper: Ground Whole	ditto	1 year	
		5 years	
Vinegar	Glass jugs with a screw cap cork or both and wooden kegs	Unlimited in tightly sealed containers	Temperatures below 32°F. will freeze vinegar

16 - SUGAR, HONEY, JAM, MOLASSES, CHOCOLATE, AND SYRUP

PRODUCT	PACKAGING	APPROXIMATE KEEPING TIME	DANGEROUS STORAGE CONDITIONS
Sugar	Cotton Bags	12-36 Mos. under normal conditions and depending upon the storage facilities	Above 60% relative humidity. Dampness. Avoid cellar storage
Sugar Powdered	Bulk cartons	50°F. 100°F. 6-12 mos. 3-5 mos.	Above 60% relative humidity. Dampness. Avoid cellar storage.
Sugar Brown	Bulk cartons	35°F.-60%(RH) 6-12 mos. 75°F.-70%(RH) 3-5 mos.	Above 70%(RH) relative humidity. Dampness. Avoid cellar storage.
Jam (**) Canned	Cans	50°F. 70°F. 90°F.	100°F. or above or lower than 10°F. Keep out of direct sunlight
		24-36 12 mos. 6 mos.	
Chocolate Bars Buds Stars Straight Wafers		60°F. 12 - 16 mos.	Above 75% relative humidity. Above 70°F.
Honey	"Combs" in wood-frames wrapped in cellophane "Strained" in glass jars or metal cans.	60°F. to 80°F.	Avoid both high and low temperature. keep dry in closed container.
		3 - 5 mos. Preferable temperature is 68°F.	
Syrup & Molasses	Glass metal cans	40°F. 70°F. 85°F.	Protect against either high or low temperature. Above 85° F. is dangerous
		1-2 mos. 2 yrs. 10-12 mos.	

The length of time apples can be held successfully in cold storage will vary with the variety and with the district where grown, as well as with their condition when harvested.

For the storage of most varieties of apples the best results are obtained by maintaining a temperature of 30° to 32° F. and a relative humidity of 85 to 88 percent.

If air-cooled storage is used, the temperature obtainable will usually not be much lower than the average of the prevailing outside temperatures. The nearer this is to 32° the better.

Investigations by the United States Department of Agriculture have shown that apples soften approximately twice as fast at 70° as at 50° F., twice as fast at 50° as at 40° F. and above twice as fast at 40° as at 32°, whereas at 30° the rate is about three-fourths that at 32°.

Apples in cold storage should be inspected frequently, in order that they may be removed while still in good condition. It is highly desirable that apples intended for storage be wrapped in oiled paper or packed in shredded oiled paper, in order to reduce damage by scald as much as possible. Apples should not be stored in the same room with potatoes because of the danger that the former will absorb undesirable odors. On the other hand, the odors given off by apples are readily absorbed by dairy products; consequently the two should not be stored in the same room.

The table below shows the normal or average storage period and the maximum storage period for the more important apple varieties when picked at proper maturity and stored immediately at 30° to 32° F.

NORMAL AND MAXIMUM STORAGE PERIOD FOR IMPORTANT APPLE VARIETIES					
VARIETY	STORAGE PERIOD		VARIETY	STORAGE PERIOD	
	NORMAL (MONTHS)	MAXIMUM (MONTHS)		NORMAL (MONTHS)	MAXIMUM (MONTHS)
Jonathan .....	2 to 3	4	Baldwin .....	3 to 5	6 to 7
Grimes Golden .....	2 to 3	4	Stayman Winesap .....	4 to 5	5 to 6
McIntosh .....	2 to 3	4 to 5	York Imperial .....	4 to 5	5 to 6
Golden Delicious .....	3 to 4	5	Arkansas (Black Twig) .	4 to 5	6
Cortland .....	3 to 4	5	Northern Spy .....	4 to 5	6
Delicious .....	3 to 4	6	Rome Beauty .....	4 to 5	6 to 7
Rhode Island Greening .	3 to 4	6	Ben Davis .....	4 to 5	8
Yellow Newtown .....	5 to 7	8	Winesap .....	5 to 7	8



## 1. STORAGE

The longest keeping varieties of cabbage belong to the Danish Ball head class. Only Danish or Hollander cabbage (old cabbage) can be stored without excessive shrinkage. More ventilating capacity than is required for most other vegetables should be provided to carry away the excessive moisture given off by the active respiration of the cabbage, and to obtain the maximum advantage of the cool night air during warm weather.

Cabbage should be handled carefully. Before it is stored, the roots and all loose leaves should be trimmed away, and the damaged and misshapened heads should be culled out. On removal from storage the heads should be trimmed again to remove loose and damaged leaves. The loss of cabbage from soft rot alone or in combination with other rots is considerable in storage. Soft rot is characterized by a soft, mushy, almost slimy decay, which after entering generally at the surface or base of the head spreads rapidly throughout the whole plant. The soft rot bacteria as a class are marked by their ability to destroy plants very quickly under favorable temperature and moisture conditions. They seldom affect uninjured plants, but require a wound or other injury to gain a foothold. Infection takes place in the field where considerable damage may be occasioned, but the greatest destruction to this crop is caused in the cabbage storage houses or in transit. Under improper storage conditions the disease spreads rapidly, frequently covering all of the outer leaves and necessitating repeated and excessive trimming. Soft rot is distinguished from other head rots by a characterized offensive odor given off from the decayed tissue.

## 2. TEMPERATURE

Cabbage in good condition can be kept in ordinary storage for approximately 12 days if the temperature does not exceed 70 degrees Fahrenheit at any time. Under no circumstances should the vegetables be brought in contact with the direct rays of the sun. The warehouse should be well ventilated in order that moisture does not collect on the cabbage and cause the leaves to become slimy and rot. Cabbage wilts quickly if held under too-dry storage conditions; hence the humidity should be high enough to keep the leaves fresh and turgid.

## 1. STORAGE

Bags should be placed on racks, not over six high, and the piles not more than six feet in diameter. Give ample ventilation and arrange the sacks so they do not touch the walls since this encourages rodent attacks. This item should be kept in a dry place and the bags moved, brushed and re-stacked frequently to change the exposure and eliminate collection of dust and dirt. The "Header and Stretcher" method, that is, by laying two sacks flat and parallel to each other and the next layer two crosswise, is the best method of stacking. Avoid broken packages, spilled beans, litter and dirt under stacks or in corners of the room.

Inspect frequently for mustiness and mold; mold will show first at seed scar dimple. If found to be musty, empty from bags and turn with a shovel to dry. Care must be taken to protect dry beans against dampness and excess heat. Beans over one year old are likely to become hard and difficult to cook.

## 2. TEMPERATURE

Dry beans will keep from one to two years in ordinary dry storage at a temperature of about 60 degrees Fahrenheit. Temperatures above 70 degrees are not advisable. High temperatures accompanied by moisture favor the growth of molds and bacteria.

## ONIONS

## 1. STORAGE

Provisions must be made for ventilation and air circulation. Sacks should not be piled over six feet, and boards should be placed between the sacks. A space of at least six inches should be provided between the rows or tiers. Onions may be kept in mesh bags if they are to be distributed within a period of two to three weeks. If kept for a longer period, they should be removed from the bags and spread on the floor in a layer not more than five inches thick. Because of their contaminating odor, onions should be stored in a separate room whenever possible, and in any event kept as far as possible from other foodstuffs. *Rot is infectious; therefore, onions must be inspected frequently, and those that show any signs of deterioration must be removed.* Sprouting is caused by sunlight and heat; consequently a cool, dark place is desired.

## 2. TEMPERATURE

If possible, onions should be kept between 32 and 40 degrees Fahrenheit. High temperatures and lack of proper ventilation are the elements that cause most spoilage. This item is very susceptible to freezing. The temperature of storage place should never be below 32 degrees Fahrenheit.

Properly prepared single strength orange juice and concentrated orange juice are good sources of vitamin C (ascorbic acid). When stored under proper conditions, retention of vitamin C activity by these products is excellent. If storage is improperly carried out at any time from the canning plant to the ultimate consumer the value of the product which is consumed largely for its vitamin C content is reduced in proportion to the length of time of improper storage. By storage is meant all conditions to which the product is subjected, including transportation and warehousing, from the time it is canned until it is consumed.

Retention of Vitamin C (Ascorbic Acid) During Storage  
for Stated Periods and at Various Temperatures

Temperature (°F)	Period (months)	Retention (%)
40	3	99
	6	98
	9	98
	12	98
60	3	96
	6	92
	9	88
	12	83
80	3	62
	6	18
	9	6
	12	6
100	1	59
	2	13
	4	8

You will note that at temperatures of 80°F. and above the loss of vitamin C is very rapid. At 100° more than one-third of the original vitamin C content is lost in one month. At 60° the retention is good and at 40° it is excellent.

Flavor and color changes roughly parallel those on the loss of vitamin C. Consequently, when a definite browning and deterioration in flavor are noticed the concentrate will have lost most of its value as a source of this vitamin. Brown, unpalatable orange concentrate should not be served.

Pears, like apples, have different keeping qualities depending on variety and section of country where grown. Pears also keep longer if picked at just the right stage of maturity and precooled immediately after harvest and before usual transit period to storage warehouses. Once removed from cold storage, pears ripen very quickly and must be eaten or processed for packing within a few days.

#### BARTLETT PEARS

Bartlett Pears should be stored at from 29° to 30° F. with a relative humidity of 85 to 90 percent. The maximum storage period under such conditions is about 90 days.

#### KIEFFER PEARS

Kieffer Pears should be stored at 30° to 31° F. with a relative humidity of 85 to 90 percent. Under such conditions these pears will store satisfactorily for from 2 to 3 months.

Fall and Winter varieties of Pears, such as Anjou, Bose, Clairgeau, Comice, Easter Beurre, Hardy, Seckel, and Winter Nelis store best at 30° to 31° F. with a relative humidity of 85 to 90 percent. Some storerooms increase relative humidity to 90 to 95 percent to prevent shriveling. These pears, along with the Kieffer variety, ripen best at temperatures of from 60° to 70° F.

It is recommended that all pears donated under USDA programs be distributed for: (a) immediate consumption, or (b) processing and packing. Additional technical information concerning storage methods, and practice may be obtained by application to the Area Field Supervisor, Food Distribution Programs Branch, Production and Marketing Administration, USDA.



## 1. STORAGE

If potatoes are received in sacks, do not pile over six feet high. Place boards between every other tier or layer of bags and separate each row by a space of at least six inches. If barrels are received they should not be piled over two high. The top layer of potatoes in the lower barrels should be removed then boards placed over the tier so as to prevent excess weight upon the potatoes. Rot is infectious, therefore, potatoes must be inspected frequently and those that show any signs of deterioration must be removed.

During storage the life processes of the potato continue in what is practically a dormant state. If there is sufficient warmth and moisture, this dormant life is hastened so that eventually sprouts appear. However, a potato that has been recently dug does not sprout as readily as an old one, even though the storage conditions are the same. Sprouting, in time, is likely to occur if the soil is not well cleaned from the potatoes.

In the life processes, part of the potato starch is broken down into carbon dioxide. Therefore, over a period of time, considerable shrinkage takes place. Thus, if kept over one year, even in cold storage, potatoes become shrunken, shriveled, and undesirable. If the storage room is unduly dry, shrinkage is pronounced owing to evaporation.

Ventilation or aeration is essential so as to supply oxygen and remove the carbon dioxide given off by the potatoes during respiration. Piles of potatoes in bulk, sacks, or crates should not be unduly large. No dimension should be over 10 feet. In order to avoid undue weight on the lower strata, the height of piles should not be over 6 feet. Light is inimical to good potato storage. Sunlight is particularly bad; even a small amount of light is injurious and, if long continued, impairs the eating qualities of the potato. The storeroom must be absolutely dark.

## 2. TEMPERATURE

The ideal storage temperature is just enough above the freezing point to be safe and avoid suboxidation (about 33 degrees Fahrenheit), yet not warm enough for the tuber to respire freely (about 40 degrees). The relative humidity must be high enough to prevent evaporation and low enough to avoid any condensation of moisture (85 to 90 percent). Experiments have shown that potatoes held for 150 days (fall to spring) at 39 degrees shrink 2.58%; those held at 48 degrees shrink 7.18%; and those held at 60 degrees shrink 11.56%.

## 1. STORAGE

Several important factors must be observed if the most satisfactory results are to be obtained in the storage of sweet potatoes. Particularly, care must be taken to avoid cutting, bruising, or otherwise injuring this commodity while placing in containers or moving to storage houses. Injured roots showing evidence of disease must be carefully excluded from storage.

The commercial varieties of sweet potatoes are the Big Stem, Jersey Yellow, Jersey and Gold Skim, which are the best known of the dry-fleshed potatoes, while the Porto Rico, Nancy Hall, Dooley, Pumpkin "Yam" and Southern Queen are the best known of the moist-fleshed types. The Triumph is a medium moist variety. The storing qualities of all varieties are about the same.

Avoid rehandling during storage. It was formerly believed that sorting and removing the rotting specimens would prevent the spread of rots, but experience and experimental studies have proved the opposite to be true. Sorting and handling cause some bruising of the roots and at the same time spread the rot organisms about so that the newly-injured surfaces become infected.

When sweet potatoes are packed in crates, and so stored, a slat floor raised four inches from the main floor should be provided in order to allow air circulation under the crates and they should be stacked in even rows to a height not to exceed six feet.

## • 2. TEMPERATURE

Sweet potatoes are unlike most perishable foods in that they require a fairly warm temperature for successful storage. When first stored after digging, sweet potatoes undergo a sweating process during which they require ample uniform ventilation and a temperature of about 85 degrees Fahrenheit, with the relative humidity below 80 per cent. This sweating period lasts from 10 to 20 days, and is completed when the potatoes have a velvet-like feel and an occasional sprout appears. The temperature is then reduced to about 50 degrees and this temperature is maintained throughout the storage period. Sweet potatoes are a more perishable product than Irish potatoes, but under proper storage conditions they will keep in good condition for four months after harvest.

\* NATIONAL AGRICULTURAL LIBRARY



1022434332



1022434332